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10/043,701	01/08/2002	Deenesh Padhi	AMAT/5933/CALB/COPPER/PJS	7735

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APPLIED MATERIALS, INC.  
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SANTA CLARA, CA 95050

EXAMINER

NICOLAS, WESLEY A

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 11/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/043,701

Applicant(s)

PADHI ET AL.

Examiner

Wesley A. Nicolas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) 37-42 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 43-47 is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

***Election/Restriction***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-36 and 43-47, drawn to a method, classified in class 205, subclass 82.
  - II. Claims 37-42, drawn to an apparatus, classified in class 204, subclass 275.1.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used to practice another materially different process such as testing the concentration of species in an electroless cell.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

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4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Todd Patterson on October 22, 2003, a provisional election was made **with** traverse to prosecute the invention of Group I, claims 1-36 and 43-47. Affirmation of this election must be made by applicant in replying to this Office action. Claims 37-42 have been withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

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applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-2, 8, 11, 22-26, 30, 32, 34, and 43-44 are rejected under 35

U.S.C. 102(e) as being anticipated by Reid (U.S. 6,458,262).

Claims 1 and 11 are rejected because Reid teaches a method of determining a test concentration of conductive species in an aqueous system, comprising:

- determining a relationship between cell resistance (*i.e.* conductivity) of an electrochemical cell and concentration of conductive species (cols. 2 and 3: "determining conductivity");
- measuring an electrochemical parameter of the electrochemical cell (cols. 2 and 3: "concentration"); and
- determining the test concentration of conductive species based upon the relationship and the electrochemical parameter (cols. 2 and 3: concentration based on conductivity measurement).

It should be noted that cell resistance and conductivity are considered one in the same because they are dependent on each other. Therefore, since conductivity determines cell resistance, and vice versa, similar processes can reasonably be expected to yield products which inherently have the same properties. In re Spada, 15 USPQ2d 1655 (CAFC 1990).

Claim 2 is rejected because Reid teaches that the conductive species comprise one or more chemical constituents selected from the group consisting of metal ions, and hydrogen ions (*i.e.* denotes acid content) (col. 3).

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Claim 8 is rejected because Reid teaches that the one or more electrochemical parameters comprise a cell voltage (claim 16).

Claims 22 and 32 are rejected because Reid teaches a method of measuring a concentration of conductive species in an electrochemical plating bath contained in an electroplating cell having an anode and a cathode, comprising:

- determining a relationship between cell resistance (*i.e.* conductivity) of the electrochemical cell and the concentration of conductive species (cols. 2 and 3: "determining conductivity");
- beginning an electroplating operation by electrically biasing the anode and the cathode (col. 4: "sampling electrolyte...from electroplating process");
- during the electroplating operation, measuring an electrochemical parameter of the electrochemical cell (cols. 2 and 3, and Abstract); and
- determining the concentration of conductive species based upon the determined relationship and the electrochemical parameter (col. 3: "(f)").

Claim 23 is rejected because Reid teaches that the electrochemical parameter is measured continuously during the electroplating operation (col. 4: "sampling electrolyte...from electroplating process" and Abstract).

Claim 24 is rejected because Reid teaches that the electrochemical plating bath flows continuously through the electrochemical cell, and the concentration of conductive species is continuously measured (col. 4: "sampling electrolyte...from electroplating process" and Abstract).

Claim 25 is rejected because Reid teaches that additional conductive species are added to the electrochemical plating bath at a rate responsive to changes in the concentration measurements (col. 3).

Claim 26 is rejected because Reid teaches that the conductive species comprise one or more chemical constituents selected from the group consisting of metal ions, hydrogen ions (*i.e.* acid content) (col. 2: "metal ions... acids").

Claim 30 is rejected because Reid teaches that one or more electrochemical parameters comprise a cell voltage (claim 16).

Claim 34 is rejected because Reid teaches that the cathode comprises a semiconductor wafer having a metal layer formed thereon (cols. 1 and 5: damascene process).

Claim 43 is rejected because Reid teaches a method for continuously controlling the acidity of an electroplating bath in an electrochemical cell during an electroplating operation, comprising:

- determining the relationship between concentration of acid in the bath and resistance (*i.e.* conductivity) of the electrochemical cell (cols. 2 and 3: "determining conductivity");
- continuously monitoring the resistance of the electrochemical cell (col. 3, "on-line" and "real time");
- based on the relationship and the resistance, continuously providing a signal indicative of the concentration of acid in the bath to a controller (col. 3); and

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- controlling the addition of acid to the bath in response to the provided signals to provide real time adjustment of the concentration of acid (col. 3).

Claim 44 is rejected because Reid teaches that the relationship of the concentration of acid to the resistance of the electrochemical cell is determined by:

- providing a first concentration of conductive species (cols. 2 and 3);
- measuring at least one electrochemical parameter of the electrochemical cell (cols. 2 and 3);
- providing a second concentration of conductive species different than the first concentration of conductive species (cols. 2 and 3); and
- measuring the at least one electrochemical parameter of the electrochemical cell (cols. 2 and 3).

### ***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.



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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 10 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reid (U.S. 6,458,262).

Reid are as applied, argued, and disclosed above and incorporated herein but fail to specifically teach the cell resistance or the difference in anode to cathode cross sectional areas.

Claim 10 is rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have had a series resistance which is less than the cell resistance because it is well known that the lower the resistance is, the more efficient the electrochemical process can be. As such, one of routine skill in the art would have desired a low resistance cell.

Claim 33 is rejected because although Reid fails to teach the difference in size between the anode and cathode cross sectional areas, it would have been obvious and within the ordinary skill in the art at the time the invention was made to have kept the sizes relatively similar because too great a deviation would have decreased cell efficiency. Furthermore, a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular changes in shape of the anode or cathode was significant to the operation and efficiency of the electrolytic cell. See for example In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

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***Allowable Subject Matter***

12. Claims 45-47 are allowable over the prior art of record.
13. Claims 3, 12, and 27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley Nicolas whose telephone number is (703)305-0082. The examiner can normally be reached on Mon.-Thurs. from 7am to 5pm.

The Supervisory Primary Examiner for this Art Unit is Roy King whose telephone number is (703) 308-1146.

The fax number for this Group is (703) 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.



**WESLEY A. NICOLAS  
PATENT EXAMINER**

November 3, 2003